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The Patent Office
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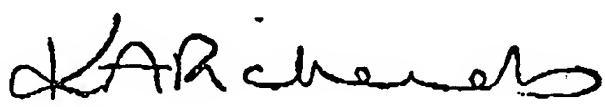
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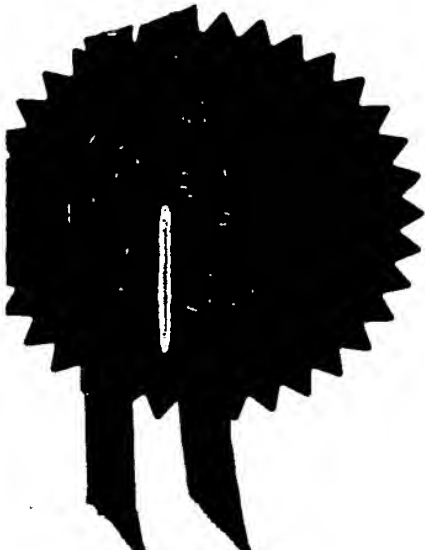
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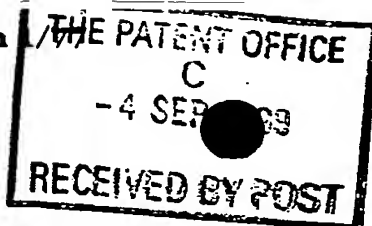
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Dated 7 September 2000





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06SEP99 1474185-4 D00239
P01/7700 0.00 - 9920819.1

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

AS\AM\P09204GB

2. Patent application number

(The Patent Office will fill in this part)

04 SEP 1999

9920819.1

3. Full name, address and postcode of the or of each applicant (underline all surnames)

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Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

7733462001
UNITED KINGDOM

4. Title of the invention

DRILLING WASTE HANDLING

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

CRUIKSHANK & FAIRWEATHER
19 ROYAL EXCHANGE SQUARE
GLASGOW
G1 3AE
SCOTLAND
UNITED KINGDOM

Patents ADP number (if you know it)

547002 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
 - b) there is an inventor who is not named as an applicant, or
 - c) any named applicant is a corporate body.
- See note (d))

DRILLING WASTE HANDLING

The present invention relates to a method and an apparatus for storage and transport of drilling waste, such as drill cuttings and similar substances as produced in the course of marine drilling operations.

5 In drilling operations, particularly in the drilling of oil and gas wells, drilling mud is often pumped downhole for a number of different purposes, such as lubrication of the drill string, prevention of corrosion, and transport of drill cuttings uphole.

10 Drilling muds may be oil or water-based, although oil-based muds are preferred in lower sections of bore, and are also generally less costly than water-based muds.

Once the drilling mud is returned to the surface, it is passed through screens or other filtering arrangements to separate the drill cuttings from the mud. The drill cuttings are collected and, in offshore operations, stored on the drilling platform or vessel before being transported onshore for processing. Once onshore, oil and moisture are separated from the cuttings, the cuttings then being
15 sent for landfill while the oil is recycled. Alternatively, the cuttings may be utilised as road building material or as fertiliser filler. It was formerly the practice to dump the cuttings at sea; however the presence of contaminants in the cuttings creates
20 environmental problems. Further, in many jurisdictions
25

to the container.

The present invention does not require the container to be located on the drilling platform or vessel, so releasing the method from many of the constraints of the prior art.

5 In a preferred embodiment, at least two containers are provided.

Preferably, the containers are together of a volume sufficient to contain the drilling waste from a complete drilling operation. Most preferably, each container is
10 capable of holding at least 500 tonnes of drilling waste.

Preferably, the method further comprises the step of agitating the drilling waste within the container. Conveniently this may be achieved by rotating or otherwise moving the container in the water; or by providing an
15 agitator within the container. The container may be provided with external fins or the like which tend to rotate or move the container in response to sea currents. This movement prevents waste from settling, and possibly unbalancing the container; settled waste may also be more
20 difficult to remove from the container.

Preferably, the method further comprises the steps of: releasing the container from its position; and transporting the container to a drilling waste recycling facility.

25 Preferably the container is positioned spaced from the platform or vessel. This facilitates installation of the container, as the tug, work boat or other vessel utilised

transported directly to the container.

Preferably, the method further comprises the step of macerating the drilling waste prior to conveying the waste to the container. This ensures that the solids in the waste are of a substantially uniform size, so facilitating conveyance to the container, and a reduced risk of blockage.

Preferably, the method further comprises the step of extracting oil from the waste prior to conveying the waste to the container. This enables at least some of the oil to be recycled and reused without the need to transport the waste onshore, and also reduces the volume of waste it is necessary to store. Preferably the method further comprises the step of adding water to the drilling waste prior to conveying the waste to the container. This has the effect of "slurrifying" the waste by reducing the relative oil content, which makes the waste easier to convey to the container and easier to process once onshore.

Preferably, the method further comprises the step of agitating the contents of the container whilst it is being transported to the recycling facility. This prevents the waste from settling out, which increases the difficulty of recycling.

Preferably, the method further comprises the steps of: providing an additional container; and maintaining at least one container at the platform or vessel.

This enables drilling waste to be received on a

The agitation means may comprise an internal rotating paddle; or may comprise external fins mounted on the container, such that the container rotates in response to sea currents.

Preferably, the container is of adjustable buoyancy.

5 Preferably, the container comprises a double skin, with a cavity between the skins which may be filled with air or seawater as desired, in order to adjust buoyancy.

10 Preferably, the connection means comprises a flexible conduit for conveying drilling waste, and most preferably a plurality of flexible conduits.

15 Preferably, the apparatus further comprises a holding tank for holding drilling waste prior to conveying the waste to the container. Preferably, the holding tank includes a macerator. Preferably, the holding tank includes a press for extracting oil from the drilling waste. Preferably, the holding tank includes means for adding water to the drilling waste.

20 These and other aspects of the present invention will now be described by way of example only and with reference to the accompanying drawings, in which:

Figure 1 illustrates an apparatus for storage and transport of drilling waste in accordance with a first aspect of the present invention;

25 Figure 2 illustrates an alternative embodiment of an apparatus for storage and transport of drilling waste; and

Figure 3 illustrates the recycling of drilling waste as stored and transported in the apparatus of Figure 1 or

18 via the conduits 20, as shown in Figure 2, or is anchored to the seabed and floats midwater, as shown in Figure 1. As the containers 12 lie beneath the sea surface, they are relatively insensitive to weather conditions.

5 As drill cuttings are brought to the surface during the course of a drilling operation, the cuttings are passed into a holding tank (not shown), where the cuttings may be macerated, some oil removed, and seawater added to the waste, prior to the slurry-like waste being passed via
10 conduit 20 into the container 12.

Once the container 12 has been filled, the tug 22 returns. The full container 12 is deballasted, by replacing the water in the skin cavity with air, and released from the base 14 or anchors 15, to rise to the sea
15 surface. The tug 22 then tows the full container 12 to a recycling facility onshore, rotating the container 12 as it does so, in order to avoid settling of the contents.

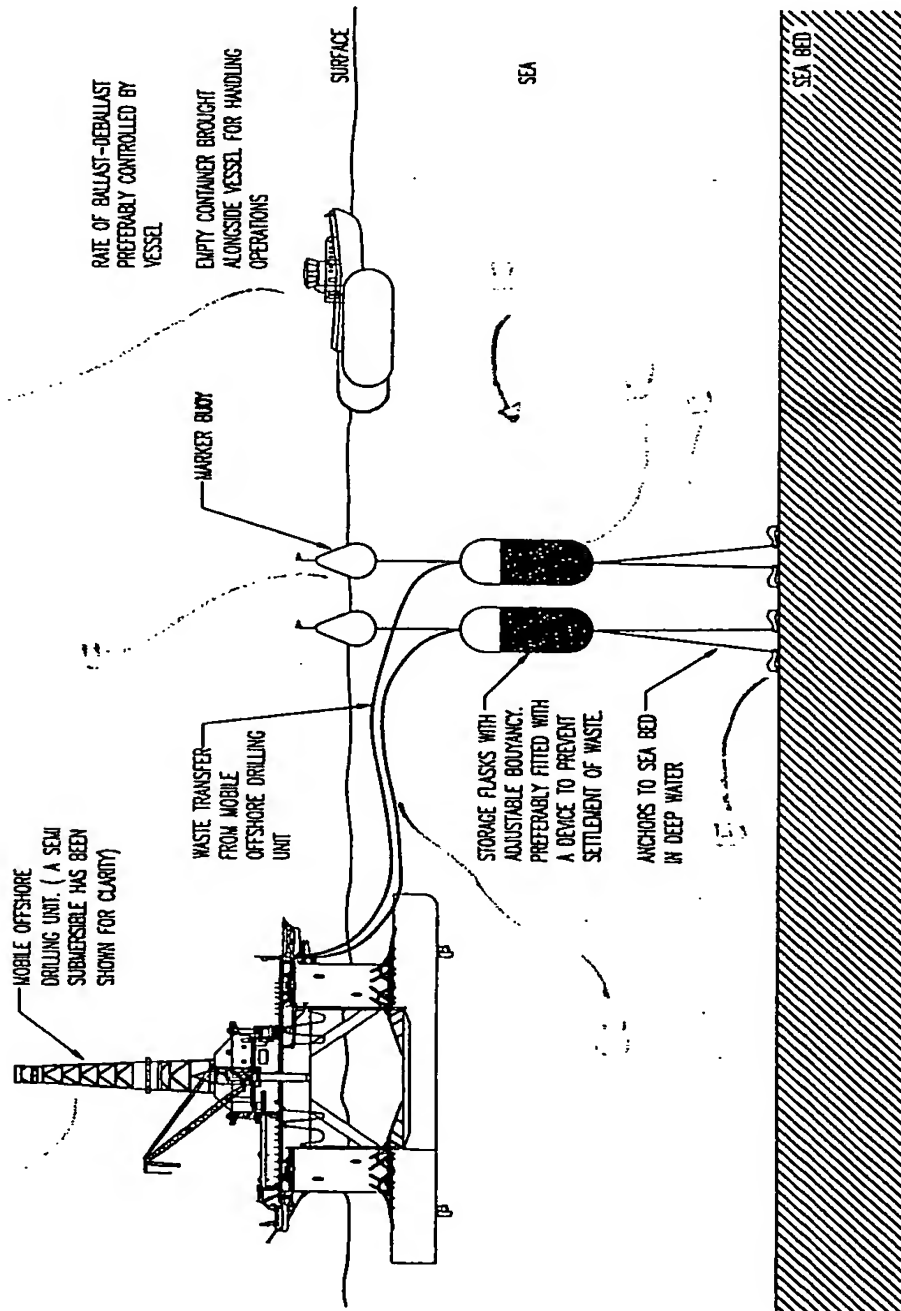
The recycling process is illustrated in Figure 3. The tug 22 moors a full container 12 above a receiving cradle
20 24 located on the sea floor at the dockside. As the tide falls, the container 12 is located and fixed in the cradle 24. The container 12 is then connected to a holding tank 26 onshore, and the contents of the container 12 pumped into the tank 26. The holding tank 26 also contains an
25 agitator 28 in order to prevent settlement of the waste. The container 12 may be removed from the cradle 24 once it has been emptied of waste, and reused. The waste is then

NOTES

ALL ANNOTATED ITEMS ARE AS A PREFERABLE METHOD, SHOWN ONLY FOR CLARITY. FOR EXACT DETAILS PLEASE REFER TO PATENT DOCUMENT.
THE RECYCLING PROCESS IS AS PER DRAWING (REF. STAR-99-003).

REFERENCE DRAWINGS:

STAR-99-002
STAR-99-003



DEEP WATER (MAIN) OPTION

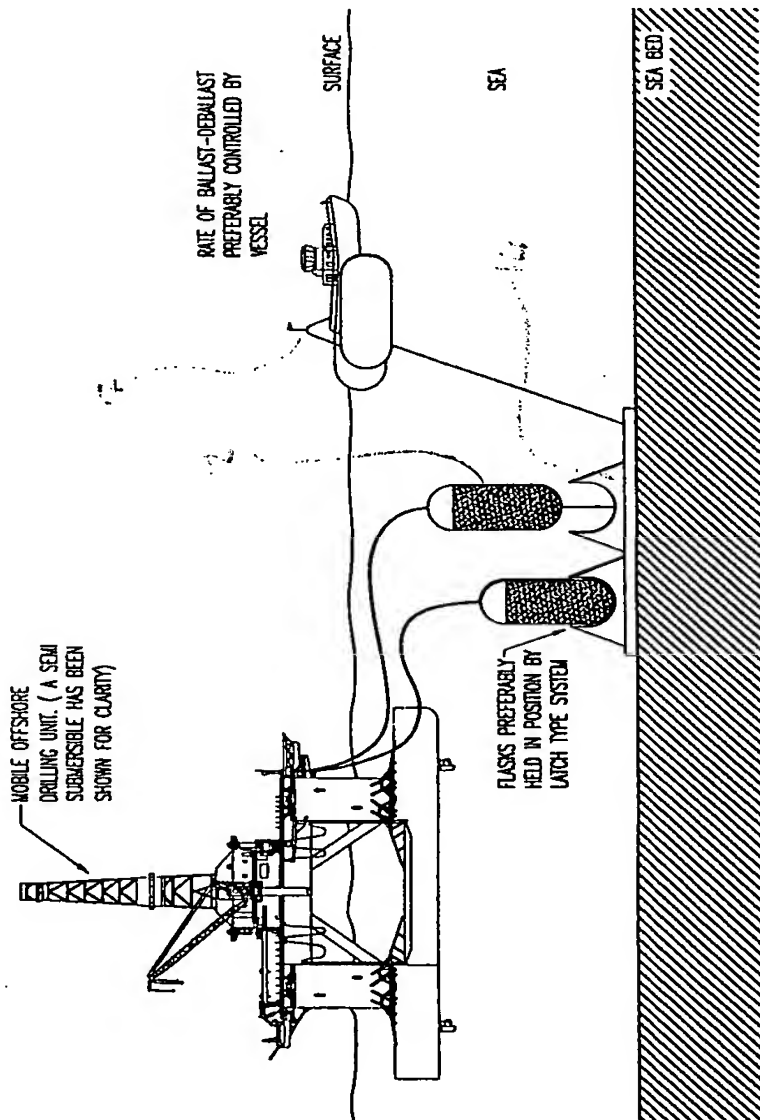
Fig. 1

STAR ENVIRONMENTAL SYSTEMS LTD. THE SQUARES ROAD OF RESERVE BANGOR NORTH 40P TEL: 09708 400 100 FAX: 09708 400 100		Drawing No.	A3
		Scale	NTS
Project -		Date	25.8.99
PATENT REF. DEEP WATER OPTION		By	JMS
Client -		Rev	0
PATENT OFFICE		Drawing No. STAR-99-001	

NOTES

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THE RECYCLING PROCESS IS AS PER DRAWING (REF. STAR-99-003).

REFERENCE DRAWINGS:
STAR-99-001
STAR-99-003



SHALLOW WATER (SECONDARY) OPTION

fig. 2

STAR ENVIRONMENTAL SYSTEMS LTD THE STABLES 1000 ST. JEROME BRIDGEWAY WEST 4TH TEL: 0208 400 100 FAX: 0208 400 100		Project No.	A3
		Scale	NTS
Patent Ref. SHALLOW WATER OPTION		Date	25.8.99
Client - PATENT OFFICE		By	JMS
		Rev/No.	0
Drawing No.		STAR-99-002	

NOTES

ALL ANNOTATED ITEMS ARE AS A PREFERABLE METHOD, SHOWN ONLY FOR CLARITY.
 FOR EXACT DETAILS PLEASE REFER TO PATENT DOCUMENT.

REFERENCE DRAWINGS:
 STAR-99-001
 STAR-99-002

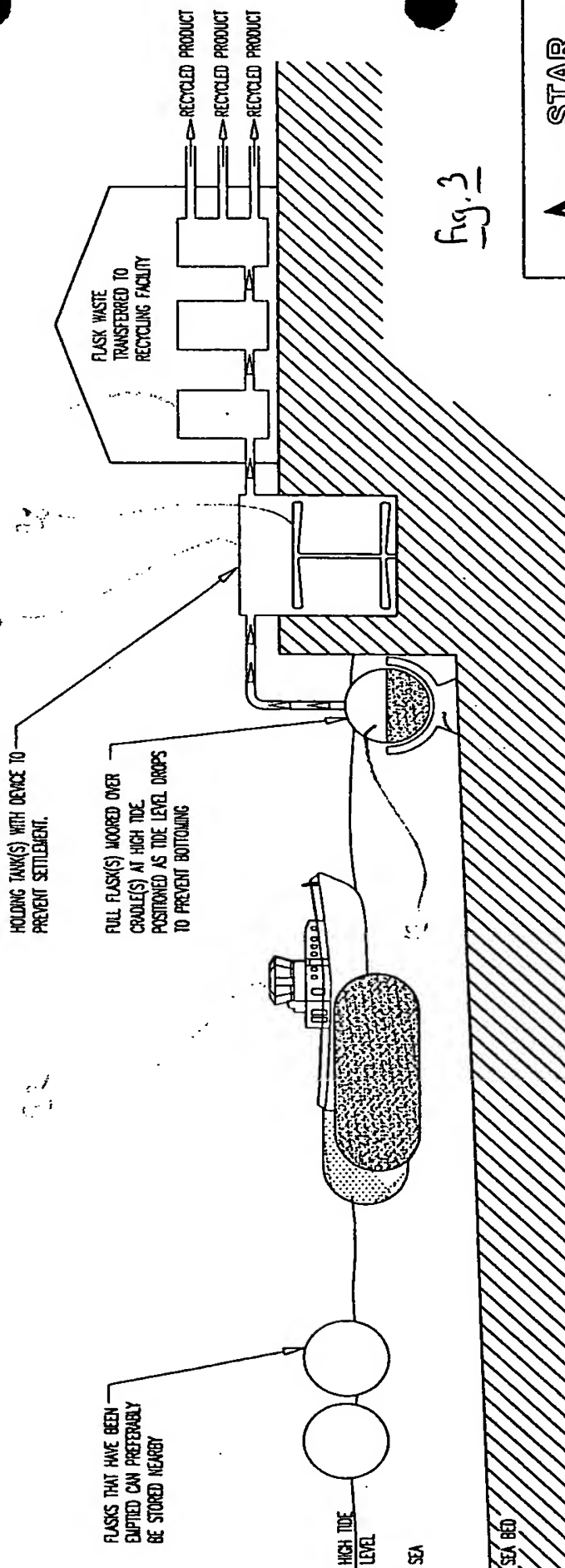


Fig. 3

STAR ENVIRONMENTAL SYSTEMS LTD. THE STABLES ROAD OF WREXHAM SHROPSHIRE WREXHAM CH64 7EP TEL: 0970 400 100 FAX: 0970 400 100		Project No.	Client	Drawing No.
		Patent Ref. Recycling Process Patent Office	Drawing No. A3 Scale NTS Price £258.99 By JMS Date 0	Drawing No. STAR-99-003